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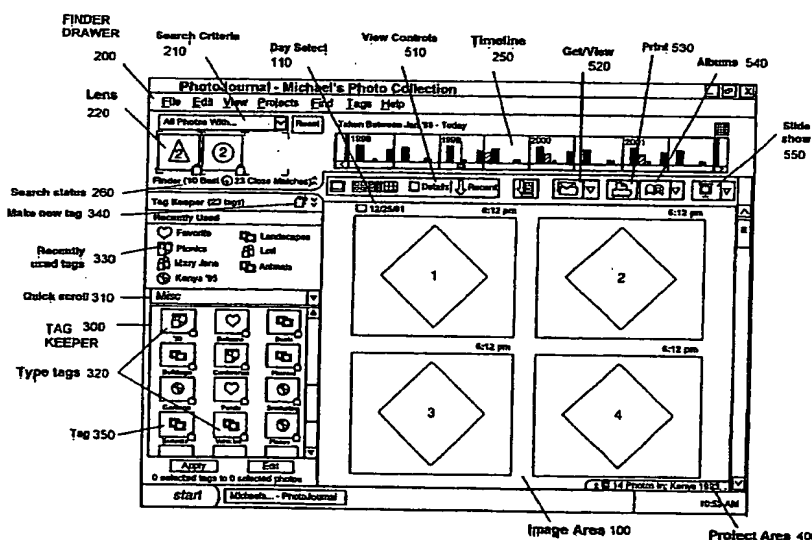
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ance Notes on Codes and Abbreviations" appearing at the begin-  
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(54) Title: **DIGITAL MEDIA MANAGEMENT APPARATUS AND METHODS**



(57) Abstract: Methods and apparatus for managing, finding and displaying objects such as digital images. Objects are tagged ("associated") with descriptive textual and numeric data ("metadata"), and stored in a relational database from which they can be selected, sorted, and found. Tags can be defined by name, tag type, and associated attributes. Objects can be tagged by dropping a tag onto the object, or relating a database record for the tag to a database record for the object. Tagged objects can be searched for and displayed according to the degree to which their metadata matches the search criteria. Visual cues can indicate whether displayed objects match all, some but not all, or none of the search criteria. Database object distributions can be displayed as histograms or scatter plots, including timelines, calendars or maps. Object distributions can be used to search for objects or to limit search results for a previous search.

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## DIGITAL MEDIA MANAGEMENT APPARATUS AND METHODS

### Background

With the advent of digital photography and the world-wide-web, there has been an exponential growth in the creation and storage of digital photographic images.

5 As the number of digital photographs taken and stored has grown, so too has the need for a convenient method of archiving, cataloguing, searching, and retrieving them. Modern methods of archiving and storing digital images typically require users to remember large amounts of information merely to locate photos that are of particular interest to them. For example, many users currently store their digital images in the  
10 hierarchical, directory-based file system structure that is native to personal computers. To find particular photos stored in such a hierarchical directory tree or structure, users must know the full pathname to the directory in which their photographs are stored.

There are other disadvantages to storing digital photographs in a hierarchical, directory-based file system. For example, cataloguing and storing groups of photos by  
15 categories such as vacation photos or wedding photos requires creating different directories for each of the desired categories. This further increases the amount of information that must be remembered in order to locate desired photos. In addition, in order to store photos in two or more overlapping categories, such as photos that include your favorite aunt and photos from your cousin's wedding, users must either  
20 store duplicate photographs, or master the concepts of directory trees and file pointers. While these are not difficult concepts for sophisticated computer users, they can be troublesome for less sophisticated users, thereby limiting the useful ways these users can store and retrieve digital photographs and photographic information.

### Summary

25 The present invention relates to methods and apparatus for storing, cataloguing, managing, organizing, finding and displaying objects such as digital images. The invention includes methods for associating ("tagging") fields of text and numeric data ("metadata") with individual objects such as images or photos, storing the objects and associated metadata as records in a relational database, and selecting,  
30 sorting, organizing and finding the objects based on their tagged metadata content.

Default metadata tags can be specified, and new metadata tags can be defined and created through a tag editor by naming the tag, selecting its tag type, optionally selecting a graphical icon that represents the tag, and filling in any remaining fields or attributes that are unique to and define the tag type. Tags can be readily associated  
5 with an object by adding a record containing the tag information or metadata to a database, and relating the tagged metadata record to a database record containing the object or a pointer to the object. Tags can also be graphically associated with an object by, for example, dragging and dropping a graphical icon representing the tag onto a graphical representation of the object. In the latter case, database records  
10 containing the tag metadata are automatically created and related to the database record containing the target object or a pointer to the target object.

Once objects have been tagged with metadata, they can be searched for according to one or more tagged search criteria. When the objects to be search for are photos, these search criteria can include, but are not limited to, the date and time the  
15 photos were taken, textual information that is associated with the photos such as the names of the people who are in the photos or the places or events where the photos were taken, designations of the photos as favorite photos, and designation of the photos as photos that have been printed, shared with others, or archived on a certain date.

20 When a database is searched for objects that match one or more tagged search criteria, the matching objects can be viewed or arranged according to the degree to which they have associated metadata that matches the search criteria. In particular, objects that match all of the search criteria can be displayed first, followed by objects that match one or more of the search criteria, and finally by objects that match none of  
25 the search criteria. Objects in the different match groups can be differentiated from one another in the display area by visual cues, such as being displayed in front of different background colors or patterns. Thus, objects matching all of the search criteria can be displayed in front of a white background, while objects matching some of the search criteria can be displayed in front of a blue background, and objects  
30 matching none of the search criteria can be displayed in front of a gray background.

The distribution of the objects stored in the database can be displayed as a histogram along a timeline. Time bands can be set along the timeline to indicate a time period that can be used to search for matching objects in the database, or to limit the search results for a given tag search to objects having temporal metadata within the indicated time period. When the timeline is used to limit the search results for a tag search, the timeline displays not only the temporal distribution of all objects in the database over the indicated time period, but also the temporal distribution of all objects in the database matching the specified tag search criteria over the indicated time period.

In addition to timelines, the temporal distribution of objects in the database can be represented in a calendar view such that the days of the calendar indicate the number of objects having metadata associated with a given day of the week in a given week of the month. The calendar view can also be used to limit the search results for a tag search, in which case the calendar view will indicate all of the days of the month associated with objects that match all of the tagged search criteria, match some of the tagged search criteria, and match none of the tagged search criteria.

The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other objects, features, and advantages of the invention will be apparent from the description and drawings, and the claims.

### **Brief Description of Drawings**

Figs. 1 illustrates one embodiment of a user interface for a computer program product in accordance with the present invention.

Fig. 2 illustrates an image displayed with its associated metadata, including its tags, in accordance with the present invention.

Fig. 3 illustrates a timeline view of the data in accordance with the present invention.

Fig. 4 illustrates a calendar view of the data in accordance with the present invention.

Fig. 5 illustrates a map view of the data in accordance with the present invention.

Fig. 6 illustrates the display of different media types that are stored in accordance with the present invention.

### Detailed Description

The present invention provides a method for users to organize and find digital  
5 images and photos by tagging them. Before being tagged, photos must be imported  
into a database where photographic metadata or information about the photos can be  
stored. While entire photos can be stored in the database, it is generally more efficient  
to store pointers to photos in the database rather than the photos themselves. Photos  
can be imported into the database from any of a number of devices or sources  
10 including, but not limited to, a digital camera, a flash memory device, a hard disk  
drive, a floppy drive, a CD-ROM, or a networked computer or file server. Once  
imported into the database, the photos can be tagged with one or more objects  
containing metadata that identifies the unique or important properties of the photo  
such as when or where the photo was taken, or who or what is the subject of the  
15 photo.

As shown in Figs. 1, in one embodiment tags 350 can be applied to photos by  
dragging and dropping graphical icons representing the tags onto one or more photos  
1-4 that are displayed in an image area 100. When a tag is dropped onto a photo, the  
database record that contains a pointer to the photo is updated to contain or point to  
20 metadata that is associated with the tag that has been dropped onto the photo. This  
metadata can include when the photo was taken, where it was taken, the nature of the  
event at which it was taken, the subject of the photo, and whether the user considers  
the photo one of his or her favorites. Once tagged, photos with specific tags or  
combinations of tags can be readily found in the database by searching the database  
25 for all records that contain the same metadata as the metadata that is associated with  
the one or more search tags.

Tags, and the metadata they contain, can be created and modified in a tag  
editor. The tag editor allows a user to specify a tag name and tag type, and to enter  
metadata in the form of tag attributes that can be stored in tags of the specified tag  
30 type. For convenience, tags can be divided into one or more tag categories. For

example, in one embodiment tags are divided into people, events, places and miscellaneous tag categories. Tags in the different tag categories generally have different tag attributes to distinguish between themselves and tags in other tag categories. In general, a tag's attributes do not need to be filled in to associate a tag with a photo. The tag itself is a form of metadata that can be associated with the photo, regardless of whether the tag's possible attributes are also associated with the photo. However, when a tag's attributes are completely or partially filled in, more metadata is associated with the tagged photo, thereby making the photo easier to search for and find.

The people tag category includes default tag types for family and friends, and can be customized to include other groups of people such as business associates, classmates, co-workers, and neighbors, and particular individuals such as a spouse, daughter, or friend. Tags in the people category can contain attributes such as a person's name, sex, birthdate, anniversary, postal and/or email address(es), phone number(s), a sharing profile specifying which if any pictures can be shared with the people associated with the tag, and the relationships between the people associated with the tag and other tagged individuals.

The events tag category includes default tag types for parties and vacations, and can be customized to include tag types for particular types of events such as concerts, plays, shows and sporting events, and for particular events such as the 2002 Boston Marathon. In addition, tags in the events category can include pre-defined calendar events such as New Years Eve, and customized calendar events such as birthdays and anniversaries. Tags in the event tag category can contain attributes corresponding to the names, locations, and dates of the underlying events associated with the tags.

The places tag category can be customized to include tag types for particular places such as a home, an office, an art museum, or a vacation destination. Tags in the places tag category can contain attributes corresponding to specific locations that are associated with photos, including the name of the location (e.g., The Metropolitan Opera House), the names of the city, state, country and region of the world in which

the photos were taken or which are the subject of the photos, and the geographical coordinates (e.g., longitude and latitude) for those places.

Finally, the miscellaneous tag category is as a customizable catchall for tags that cannot be easily grouped into a meaningful global category with other tags.

- 5 Examples of miscellaneous tag types include tags for an apartment or home search, tags for artistic or photos, and tags for particular cars or types of cars. Miscellaneous tags can contain attributes corresponding to the name of the subject of the photo, and where and when the photo was taken.

- 10 As shown in Fig. 2, the metadata that is associated with a photo can be viewed and edited directly by displaying the photo together with its associated metadata. Fig. 2 shows a photo entitled "Lori on the road at Legoland" associated with a customized people tag, Lori R., and a customized places tag, San Diego. The tags and title indicate this is a photo of Lori R. taken on a trip to Legoland in San Diego, CA. This photo can be retrieved from the database in any number of different ways, together  
15 with different photos that are related to this photo in different ways, as discussed below.

- In general, photos in the database that have been tagged with one or more tags can be searched for and sorted by querying the database for all photos having tags that match one or more search tags or the metadata contained within the one or more  
20 search tags. These metadata can include, but are not limited to, data indicating whether photos are favorites; frequently viewed; similar to currently selected photos; untagged; taken on a particular day or recurring event; shared with or received from certain people; imported from certain places; and printed or exported on certain dates. In addition, the metadata can include the subject of the photo, whether a person, place,  
25 or event; as well as the place and/or event at which the photo was taken. For example, the photo of Lori R. in Legoland can be retrieved from the database by querying the database for all photos tagged with a Lori R. tag. This search will pull up all photos of Lori R., including the Legoland photo, regardless of where the photos were taken. Alternatively, the Legoland photo can be retrieved by searching the database for all  
30 photos tagged with a San Diego tag. This search will pull up all photos taken in or of San Diego, including the Legoland photo, regardless of who is in the photo. Finally,

the Legoland photo can be retrieved by searching the database for all photos tagged with both a Lori R. tag and a San Diego tag. This search will pull up all photos taken in or of San Diego that include Lori R, including the Legoland photo.

The database search for photos that match certain tags or groups of tags can be graphically constructed by dragging various icons representative of tags 350 into a graphical query builder or lens 220, and searching the database for records with matching tags or metadata. When search criteria are applied to the photos in the database, the order in which the photos are displayed is updated so that "best match" photos or photos that match all of the search criteria are displayed at the top of an image area 100 in front of a first background color or pattern, while "close match" photos that match one or more but not all of the search criteria are displayed after the "best match" photos and are visually distinguished from them by, for example, being displayed in front of a second background color or pattern, and "no match" photos that fail to match any of the search criteria are displayed at the bottom of the image area in front of a third background color or pattern.

Perhaps the easiest search to conduct on tagged photos is a search for photos taken on a certain date, or within a certain period of time. As previously mentioned, among the metadata that can be stored with a photo is information indicating the date and time a photo was taken. This information is often automatically associated with a photo when the photo is created or when the photo is scanned into a digital scanner. If the photo is created on a digital camera, the camera will generally tag the photo with the date and time the photo was taken. If the photo is scanned into a digital scanner, the scanner will generally tag the photo with the date and time it was scanned. If for any reasons neither the digital camera nor digital scanner tags the photo with the date and time information, the database will tag the photo with the information when it is first imported.

As shown in Fig. 3, when photos are imported into a database, the temporal metadata associated with the photos can be used to present a histogram of photos in the form of a timeline 250 as shown in Fig. 1. The timeline 250 can show the number of photos taken as a function of time over some period of time that can range from the time the first photo in the database was taken to the present. The timeline 250 can be



used by itself, or with other tags 350 to specify the criteria used to search for matching photos. The timeline includes adjustable time bands 251 that can be moved to allow timeline 250 to specify the time period that is used to find matching photos.

When the timeline 250 is used by itself to search for matching photos, the adjustable time bands 251 can be moved to find all photos in the database that are tagged with a date or timestamp that falls within the range indicated by the adjustable time bands 251. Photos falling within this range are designated "best match" photos, and can be viewed as such in image area 100. For example, the timeline 250 can be used by itself to find all photos taken between Jan. 1, 2000 and Feb. 28, 2000 by moving the adjustable time bands 251 to these two respective dates. The photos in the database that have been tagged with a timestamp falling between these two dates can be retrieved from the database, and displayed in the "best match" section of image area 100.

In addition to finding photos according to their timestamp, the timeline 250 can be used with other metadata to limit search tag results. For example, if the adjustable time bands 251 of timeline 250 indicate the period of interest extends from Jan. 1, 2000 to Feb. 28, 2000, searching the database for all photos having a San Diego tag will return the photo "Lori on the road at Legoland" as a "best match" photo, and display the photo in image area 100, only if the photo was taken sometime between Jan. 1, 2000 and Feb. 28, 2000. If the photo was taken outside of this time period, it would only appear as a "close match" photo in image area 100. When tag searches are conducted in conjunction with timeline 250, the timeline displays the total number of photos in the database per unit time period in a first color which may be a solid color, and the total number of photos in the database that match the tagged search criteria as "best" or "close" matches in a second color which may be a hatched pattern or color.

In one embodiment, the timeline 250 shown in Fig. 3 does not display the exact number of photos taken during a given period of time, but rather displays a vertical bar graph with bar heights that are representative of the number of photos taken during a given period of time normalized to the average number of photos taken during all such similar periods of time in the database. For example, for a given

period of time, the displayed vertical bar can have a height of 0 when no photos have been taken during that period; 1 when one to five photos have been taken during that period; 2 when the normalized number of photos taken during that period was up to 50% of the average number of photos taken during all time periods; 3 when the  
5 normalized number of photos taken during that period was between 50% and 80% of the average number of photos taken during all time periods; 4 when the normalized number of photos taken during that period was between 80% and 120% of the average number of photos taken during all time periods; 5 when the normalized number of photos taken during that period was between 120% and 150% of the average number  
10 of photos taken during all time periods; 6 when the normalized number of photos taken during that period was between 150% and 200% of the average number of photos taken during all time periods; and 7 when the normalized number of photos taken during that period was more than 200% of the average number of photos taken during all time periods.

15 As shown in Fig. 4, in addition to timeline 250, photos taken on a particular day or during a particular month can also be found by displaying the photos in a 2-D histogram or scatter plot such as the calendar view shown in the figure. The calendar view displays all of the photos that have been taken, scanned, or imported into the database on any day in a given month as a function of the day of the week the photos  
20 were taken, and the week in the month. If a particular day of the month is selected in the calendar view, all photos taken on that day can be retrieved from the database as "best match" photos. For example, Fig. 3 shows that during the month of June, 2001 two sets of photos were taken. The first set contains a single photo taken on June 8, while the second set contains 10 photos taken on June 18. By selecting the June 18  
25 calendar day, the 10 photos taken on June 18 are selected as the "best match" photos, and can be displayed in image area 100.

The calendar view can also display the results of a tag search in the month-at-a-glance mode. When so used, each day in the calendar can indicate not only whether  
30 any photos were taken on that day, but whether the photos taken on that day fall into the "best match", "close match", or "no match" group with respect to the tagged search criteria. For example, if the Legoland photo described in Fig. 2 was one of ten photos of Lori R. taken in San Diego on June 18, 2001, and a search were done for all

photos having a San Diego tag, then the June 18, 2001 square in Fig. 3 would indicate that day as having photos in the "best match" group. If, however, a search were done for all photos having a New York tag, the June 18, 2001 square in Fig. 3 would indicate that day as having photos in the "no match" group. Finally, if a search were  
5 done for all photos having a New York tag and a Lori R. tag, the June 18, 2001 square in Fig. 3 would indicate that day as having photos in the "close match" group.

The particular group into which a set of photos taken on a given calendar day falls can be indicated on the calendar using the same color based indication scheme used to indicate matching photo groups that are displayed in the viewing area. Thus,  
10 calendar days containing one or more photos in the "best match" group can be presented as white squares, while calendar days containing one or more photos in the "close match" group and no photos in the "best match" group can be presented as blue squares, and calendar days containing no photos in either the "best match" or "close match" groups can be presented as gray squares.

15 As shown in Fig. 5, in addition to the timeline 250 and calendar views, data can be searched for and displayed in an alternate 2-D histogram or scatter plot such as a map view. In the map view, the place tag metadata is used to display the geographic distribution of photos in the database. Like the timeline 250 and calendar views, the map view can be used to search for photos either by itself, or in conjunction with one  
20 or more tag searches. If the map view is used by itself to search for photos, icons representing the places where photos in the database have been taken are displayed on a map such as the world map shown in Fig. 5. When a location on the map is selected, photos taken in that location can be retrieved from the database as photos in the "best match" group. For example, if the location of Kenya on the map in Fig. 5 is  
25 selected, photos taken in Kenya can be selected from the database, and can be displayed in image area 100 as "best match" photos.

The map view can also be used in conjunction with a tag search. When so used, the map view will display not only the distribution of photos as a function of geographic location, but whether the photos taken at the various geographic locations  
30 fall in the "best match", "close match", or "no match" group with respect to the tagged search criteria. For example, if a search for all photos having an African tag were

displayed in the map view, the map view would indicate that photos taken from the Kenya Safari fall into the "best match" group, while all of the other photos shown in Fig. 5 fall into the "no match" group. As with the calendar and timeline 250 views, the particular group into which a set of photos taken from a given location falls can be indicated on the map using the same color based indication scheme used to indicate matching photo groups that are displayed in image area 100. Thus, locations containing one or more photos in the "best match" group can be presented as a white area, while locations containing one or more photos in the "close match" group and no photos in the "best match" group can be presented as a blue area, and locations containing no photos in either the "best match" or "close match" groups can be presented as a gray area.

The map view can be varied in size and shape to accommodate the geographic extent of the photos that are either in the database or that are responsive to a tag search conducted on the photos in the database. Thus, if a map view is used to display or further search among database photos having a North American tag, the map view can be limited to a view of the North American continent. The map view can also be varied in size and shape by selecting particular regions of a map, such as the western region of the United States, or by zooming in and out of the currently displayed map region. Photos corresponding to particular locations within a map view, like San Diego, can be geographically found directly from the map view.

Once photos matching a given set of tags are found, they can be selected as a group, and various photo management functions such as printing, sharing, or exporting the photos to a slide show or to a photo album can be performed on the group. As a default, all photos in the "best match" group are selected when selecting photos that match a given set of tag search criteria. However, the default can be changed such that all photos in both the "close match" and "best match" groups are selected when selecting photos that match a given set of tag search criteria.

It should be noted that while the invention has been described in terms of managing, cataloguing, searching, and finding digital images and photographs, the invention can equally be used to manage, catalogue, search for and find other types of digital media such as video files, audio files, photo slide shows, and photo albums.

These different types of media can be distinguished from one another with a tag of tag type media. The media tag, when applied to a media object, can graphically indicate the type of media object that is stored in the database.

As shown in Fig. 6, a video file 600 can be stored in the database and  
5 identified by displaying its first frame together with an overlaid video file icon. Similarly, an audio file 610 can be stored in the database and identified by displaying the title of the audio file together with an audio file icon. Audio files can be associated with and stored as a component part of a slide show or photo album, and can be played as a soundtrack whenever the slide show or photo album is viewed.  
10 Slide shows such as slide show 620, and photo albums such as photo album 630 can also be stored in the database, and iconically identified as shown Fig. 6. Each of these objects can be tagged, searched for, and manipulated using the same tools that are used to tag, search for, and manipulate digital photos, as previously discussed.

While the invention has been described as a computer program or algorithm,  
15 the invention can be implemented in digital electronic circuitry, or in computer hardware, firmware, software, or in any combinations of them. Apparatus of the invention can be implemented in a computer program product tangibly embodied in a machine-readable storage device for execution by a programmable processor; and method steps of the invention can be performed by a programmable processor  
20 executing a program of instructions to perform functions of the invention by operating on input data and generating output. The invention can be implemented advantageously in one or more computer programs that are executable on a programmable system including at least one programmable processor coupled to receive data and instructions from, and to transmit data and instructions to, a data  
25 storage system, at least one input device, and at least one output device. Each computer program can be implemented in a high-level procedural or object-oriented programming language, or in assembly or machine language if desired; and in any case, the language can be a compiled or interpreted language. Suitable processors can include both general and special purpose microprocessors. Generally, a processor will  
30 receive instructions and data from a read-only memory and/or a random access memory. Generally, a computer will include one or more mass storage devices for storing data files; such devices include magnetic disks, such as internal hard disks and

removable disks; magneto-optical disks; and optical disks. Storage devices suitable for tangibly embodying computer program instructions and data include all forms of non-volatile memory, including by way of example semiconductor memory devices, such as EPROM, EEPROM, and flash memory devices; magnetic disks such as

5 internal hard disks and removable disks; magneto-optical disks; and CD-ROM disks. Any of the foregoing can be supplemented by, or incorporated in, application-specific integrated circuits (ASICs).

While the invention has been described in terms of particular embodiments, it should be understood that other embodiments are possible as would be apparent to

10 one of ordinary skill in the art. Accordingly, these and other embodiments are within the scope of the following claims.

What is claimed is:

1. A method for graphically constructing a database query, comprising:
  - receiving a collection of objects, wherein each object in the collection is associated with metadata that describes one or more attributes of the object;
  - generating a visual representation of a distribution of objects in the collection as a function of at least a portion of the descriptive metadata associated with the objects; and
  - receiving user input defining a selection in the visual representation of the distribution of objects to construct a database query.
2. The method of claim 1, wherein the step of generating a visual representation of a distribution of objects comprises generating a histogram representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects.
3. The method of claim 2, wherein the step of generating a histogram representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprises generating a timeline representing the distribution of objects as a function of temporal metadata associated with the objects.
4. The method of claim 3, wherein the temporal metadata is a date or timestamp associated with each of the objects.
5. The method of claim 2, wherein the step of generating a histogram representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprises generating a map showing the spatial distribution of the objects.
6. The method of claim 2, wherein the step of generating a histogram representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprises generating a calendar showing the temporal distribution of the objects.
7. The method of claim 1, wherein the step of generating a visual representation of a distribution of objects as a function of at least a portion of the descriptive

metadata associated with the objects comprises generating a scatter plot representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects.

8. The method of claim 7, wherein the step of generating a scatter plot representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprises generating a map showing the spatial distribution of the objects.

9. The method of claim 7, wherein the step of generating a scatter plot representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprises generating a calendar showing the temporal distribution of the objects.

10. The method of claim 1, wherein the step of receiving user input defining a selection of the visual representation of the distribution of objects to construct a database query comprises receiving user input selecting a portion of the visual representation of the distribution of objects.

11. The method of claim 1, wherein the step of receiving user input defining a selection of the visual representation of the distribution of objects to construct a database query comprises receiving user input limiting the display range of the visual representation of the distribution of objects.

12. A method for managing a collection of objects, comprising:

using one or more search tags to query a database for objects having metadata that matches the metadata associated with the one or more search tags;

categorizing the collection of objects in the database into at least a best match group and a no match group according to the results of the search tag query; and

displaying a representation of the objects from both the best match group and the no match group while distinguishing the objects in the best match group from the objects in the no match group.



13. The method of claim 12, wherein the step of distinguishing the objects in the best match group from the objects in the no match group comprises providing a visual cue to distinguish the objects in the best match group from the objects in the no match group.
14. The method of claim 13, wherein providing a visual cue to distinguish the objects in the best match group from the objects in the no match group comprises displaying the objects in the best match group in front of a background having a first background color, and displaying the objects in the no match group in front of a background having a second background color.
15. The method of claim 12, further comprising categorizing the objects into a close match group; and displaying the objects from the best match group, close match group, and no match group while distinguishing the objects in each group from the objects in each of the remaining groups.
16. The method of claim 12, further comprising generating a visual representation of a distribution of the objects in each of the best match and no match groups as a function of at least a portion of the descriptive metadata associated with the objects in each of the groups.
17. The method of claim 16, wherein the step of generating a visual representation of a distribution of the objects in each of the best match groups and no match groups further comprises displaying a visual representation of a distribution of the objects in the best match group and no match group on a histogram.
18. The method of claim 17, wherein the histogram is a timeline representing a temporal distribution of the objects in the best match group and no match group.
19. The method of claim 17, wherein the histogram is a map showing the spatial distribution of the objects in the best match group and no match group.
20. The method of claim 17, wherein the histogram is a calendar showing the temporal distribution of the objects in the best match group and no match group.

21. The method of claim 16, wherein the step of generating a visual representation of a distribution of the objects in each of the best match groups and no match groups further comprises displaying a visual representation of a distribution of the objects in the best match group and no match group on a scatter plot.

22. The method of claim 21, wherein the step of generating a scatter plot representing the distribution of objects in the best match and no match groups comprises generating a map showing the spatial distribution of objects in the best match and no match groups.

23. The method of claim 21, wherein the step of generating a scatter plot representing the distribution of objects in the best match and no match groups comprises generating a calendar showing the distribution of objects in the best match and no match groups as a function of date.

24. A method for displaying a collection of objects,  
comprising:

using one or more search tags to query a database for objects having metadata that matches the metadata associated with the one or more search tags; and

displaying a visual representation of a distribution of the objects responsive to the search tag query as a function of at least a portion of the metadata.

25. The method of claim 24, wherein the visual representation of the distribution of the objects responsive to the search tag query is a histogram.

26. The method of claim 25, wherein the histogram is a timeline representing a temporal distribution of the objects responsive to the search tag query.

27. The method of claim 25, wherein the histogram is a map showing the spatial distribution of the objects in the best match group and no match group.

28. The method of claim 25, wherein the histogram is a calendar showing the temporal distribution of the objects in the best match group and no match group.

29. The method of claim 24, wherein the visual representation of the distribution of the objects responsive to the search tag query is a scatter plot.

30. The method of claim 29, wherein the scatter plot is a calendar representing the distribution of the objects responsive to the search tag query as a function of date.

31. The method of claim 29, wherein the scatter plot is a map representing a spatial distribution of the objects responsive to the search tag query.

32. A computer program product for graphically constructing a database query, the computer program product comprising instructions operable to cause a programmable processor to:

receive a collection of objects, wherein each object in the collection is associated with metadata that describes one or more attributes of the object;

generate a visual representation of a distribution of objects in the collection as a function of at least a portion of the descriptive metadata associated with the objects;

and receive user input defining a selection in the visual representation of the distribution of objects to construct a database query.

33. The computer program product of claim 32, wherein the instructions to generate a visual representation of a distribution of objects comprise instructions to generate a histogram representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects.

34. The computer program product of claim 33, wherein the instructions to generate a histogram representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprise instructions to generate a timeline representing the distribution of objects as a function of temporal metadata associated with the objects.

35. The computer program product of claim 34, wherein the temporal metadata is a date or timestamp associated with each of the objects.

36. The computer program product of claim 33, wherein the instructions to generate a histogram representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprise instructions to generate a map showing the spatial distribution of the objects.

37. The computer program product of claim 33, wherein the instructions to generate a histogram representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprise instructions to generate a calendar showing the temporal distribution of the objects.
38. The computer program product of claim 32, wherein the instructions to generate a visual representation of a distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprise instructions to generate a scatter plot representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects.
39. The computer program product of claim 38, wherein the instructions to generate a scatter plot representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprise instructions to generate a map showing the spatial distribution of the objects.
40. The computer program product of claim 38, wherein the instructions to generate a scatter plot representing the distribution of objects as a function of at least a portion of the descriptive metadata associated with the objects comprise instructions to generate a calendar showing the temporal distribution of the objects.
41. The computer program product of claim 32, wherein the instructions to receive user input defining a selection of the visual representation of the distribution of objects to construct a database query comprise instructions to receive user input selecting a portion of the visual representation of the distribution of objects.
42. The computer program product of claim 32, wherein the instructions to receive user input defining a selection of the visual representation of the distribution of objects to construct a database query comprise instructions to receive user input limiting the display range of the visual representation of the distribution of objects.
43. A computer program product for managing a collection of objects, the computer program product comprising instructions operable to cause a programmable processor to: use one or more search tags to query a database for objects having metadata that matches the metadata associated with the one or more search tags;

categorize the collection of objects in the database into at least a best match group and a no match group according to the results of the search tag query; and

display a representation of the objects from both the best match group and the no match group while distinguishing the objects in the best match group from the objects in the no match group.

44. The computer program product of claim 43, wherein the instructions to distinguish the objects in the best match group from the objects in the no match group comprise instructions to provide a visual cue to distinguish the objects in the best match group from the objects in the no match group.

45. The computer program product of claim 44, wherein the instructions to provide a visual cue to distinguish the objects in the best match group from the objects in the no match group comprise instructions to display the objects in the best match group in front of a background having a first background color, and to display the objects in the no match group in front of a background having a second background color.

46. The computer program product of claim 43, further comprising instructions operable to cause the programmable processor to categorize the objects into a close match group; and to display the objects from the best match group, close match group, and no match group while distinguishing the objects in each group from the objects in each of the remaining groups.

47. The computer program product of claim 43, further comprising instructions operable to cause a programmable processor to generate a visual representation of a distribution of the objects in each of the best match and no match groups as a function of at least a portion of the descriptive metadata associated with the objects in each of the groups.

48. The computer program product of claim 47, wherein the instructions to generate a visual representation of a distribution of the objects in each of the best match groups and no match groups further comprise instructions to display a visual representation of a distribution of the objects in the best match group and no match group on a histogram.

49. The computer program product of claim 48, wherein the histogram is a timeline representing a temporal distribution of the objects in the best match group and no match group.

50. The computer program product of claim 48, wherein the histogram is a map showing the spatial distribution of the objects in the best match group and no match group.

51. The computer program product of claim 48, wherein the histogram is a calendar showing the temporal distribution of the objects in the best match group and no match group.

52. The computer program product of claim 47, wherein the instructions to generate a visual representation of a distribution of the objects in each of the best match groups and no match groups further comprise instructions to display a visual representation of a distribution of the objects in the best match group and no match group on a scatter plot.

53. The computer program product of claim 52, wherein the instructions to generate a scatter plot representing the distribution of objects in the best match and no match groups comprise instructions to generate a map showing the spatial distribution of objects in the best match and no match groups.

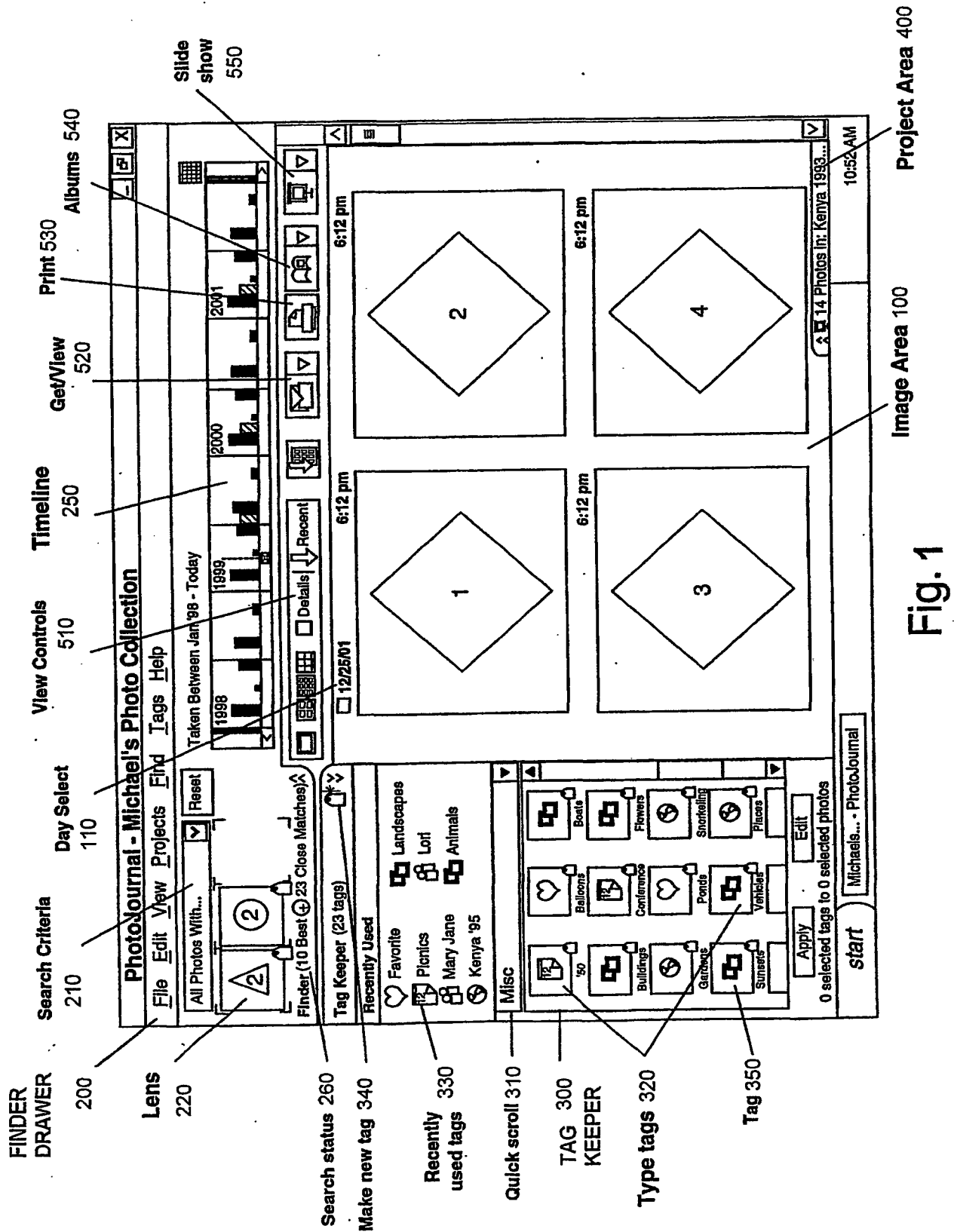
54. The computer program product of claim 52, wherein the instructions to generate a scatter plot representing the distribution of objects in the best match and no match groups comprise instructions to generate a calendar showing the distribution of objects in the best match and no match groups as a function of date.

55. A computer program product for displaying a collection of objects, the computer program product comprising instructions operable to cause a programmable processor to:

use one or more search tags to query a database for objects having metadata that matches the metadata associated with the one or more search tags; and

display a visual representation of a distribution of the objects responsive to the search tag query as a function of at least a portion of the metadata.

56. The computer program product of claim 55, wherein the visual representation of the distribution of the objects responsive to the search tag query is a histogram.
57. The computer program product of claim 56, wherein the histogram is a timeline representing a temporal distribution of the objects responsive to the search tag query.
58. The computer program product of claim 56, wherein the histogram is a map showing the spatial distribution of the objects in the best match group and no match group.
59. The computer program product of claim 56, wherein the histogram is a calendar showing the temporal distribution of the objects in the best match group and no match group.
60. The computer program product of claim 55, wherein the visual representation of the distribution of the objects responsive to the search tag query is a scatter plot.
61. The computer program product of claim 60, wherein the scatter plot is a calendar representing the distribution of the objects responsive to the search tag query as a function of date.
62. The computer program product of claim 60, wherein the scatter plot is a map representing a spatial distribution of the objects responsive to the search tag query.





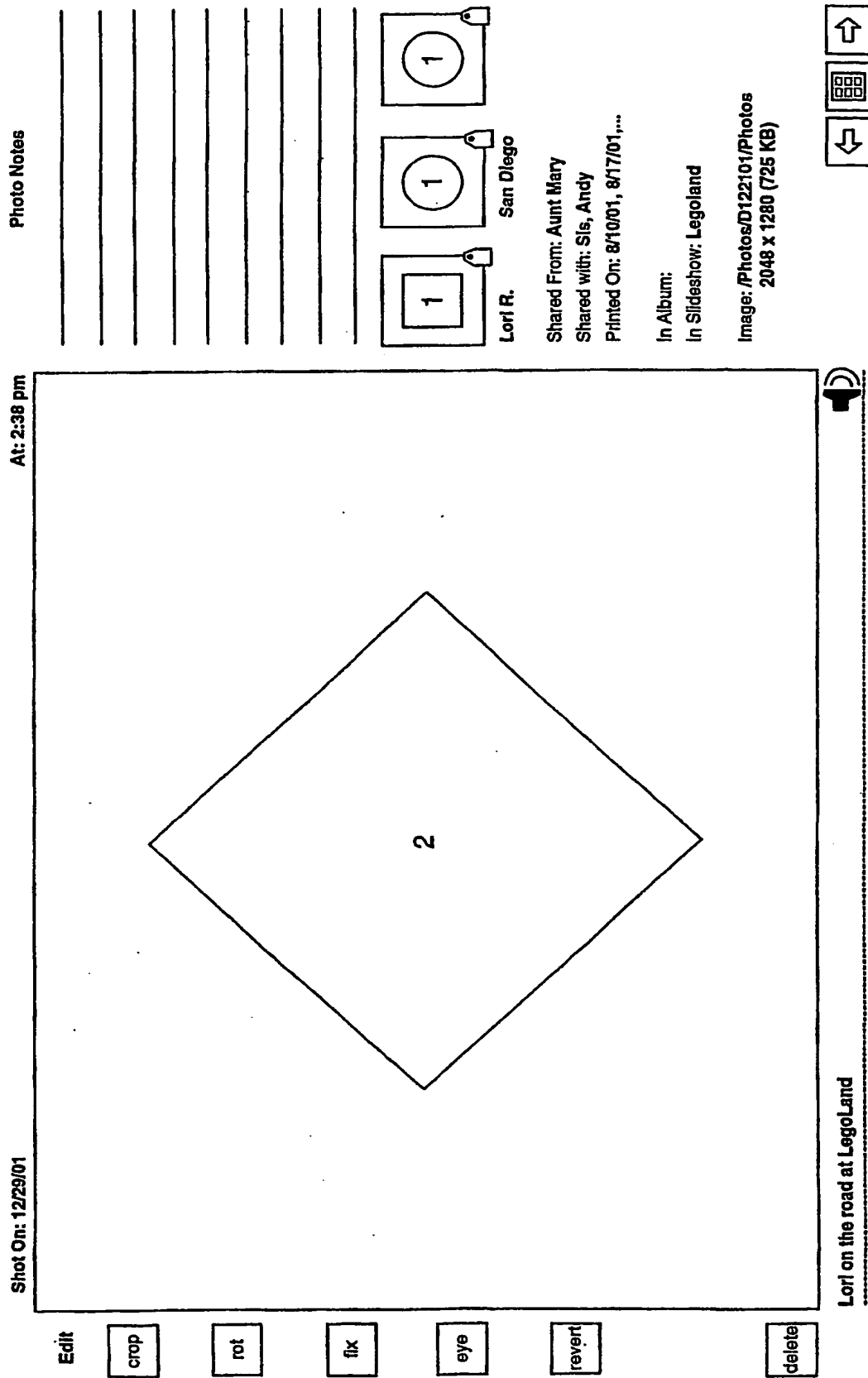


Fig.2

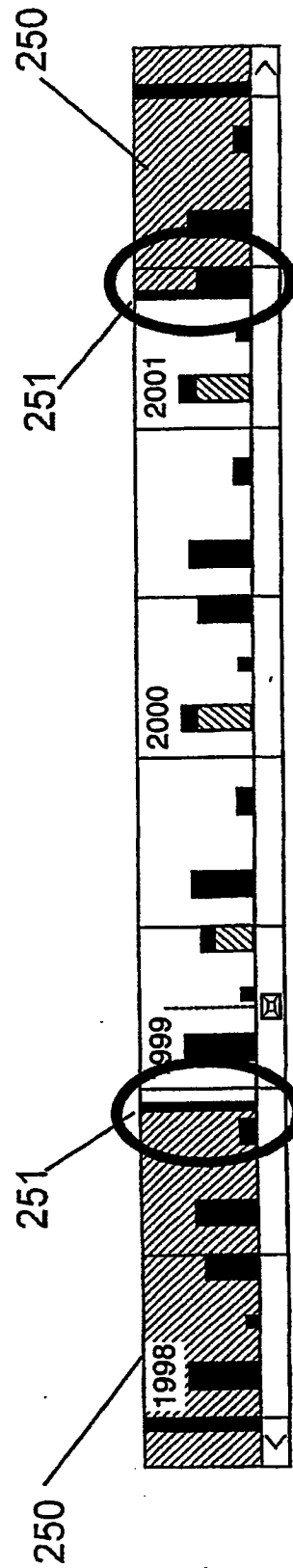


Fig. 3

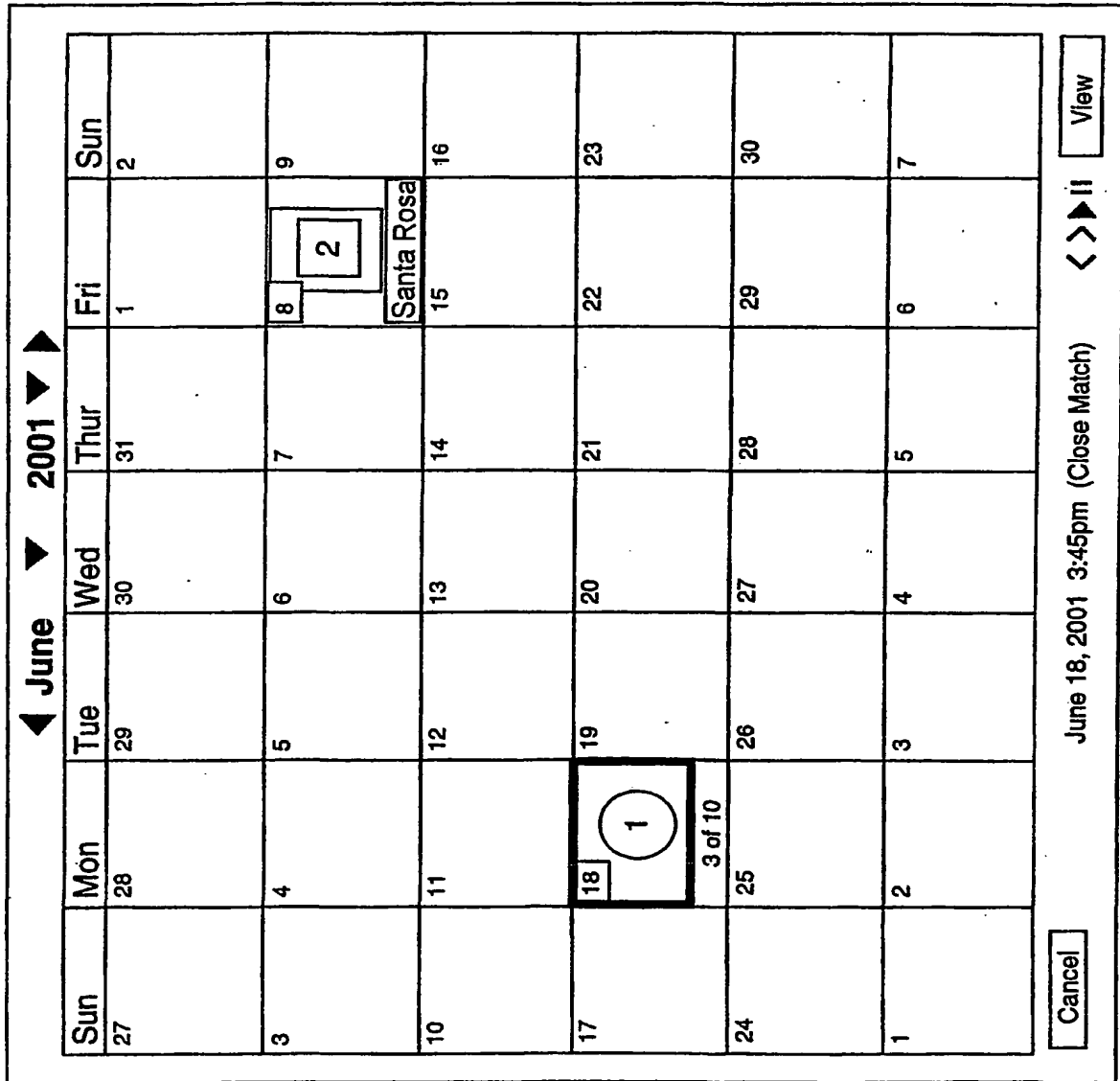


Fig. 4

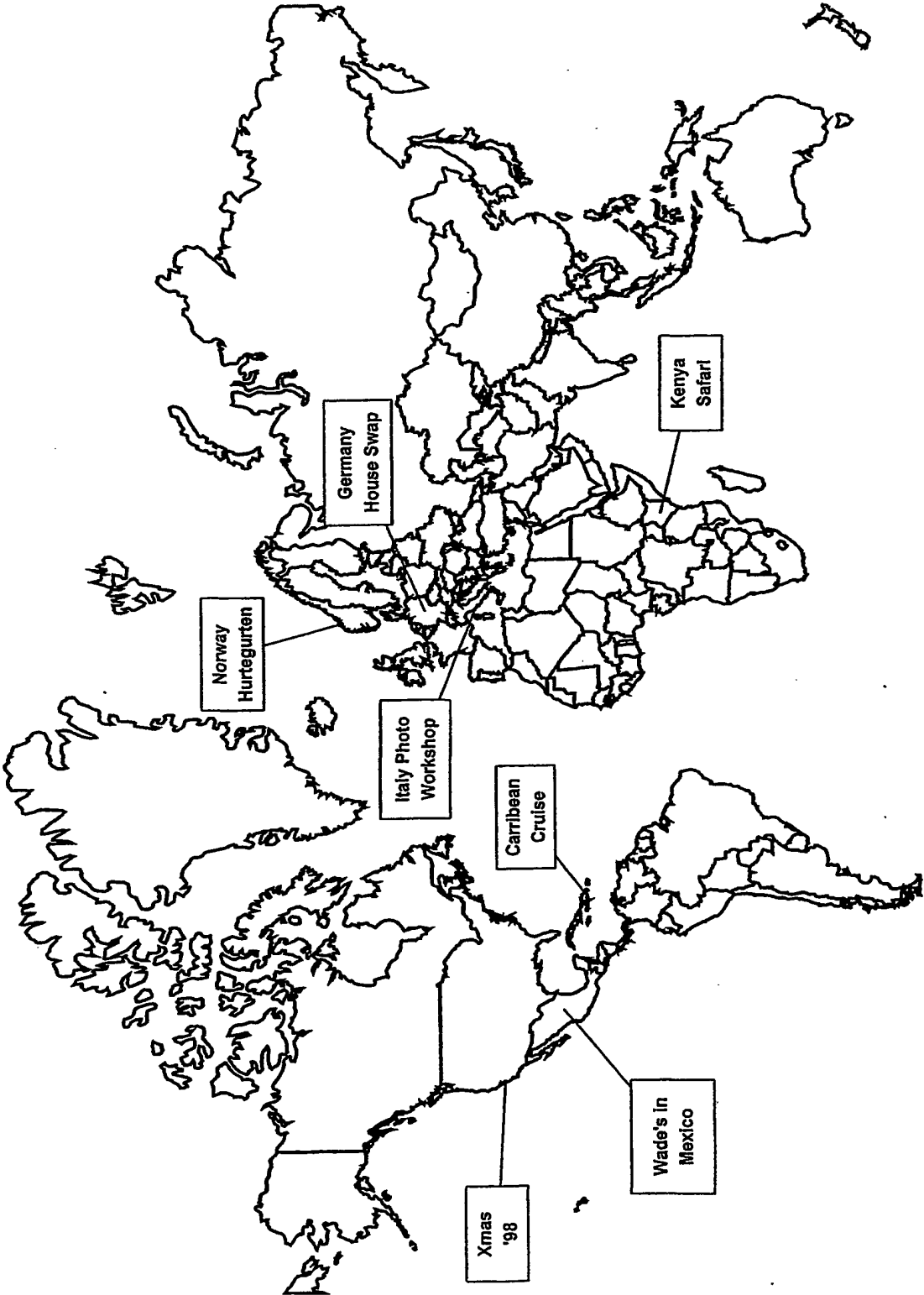


FIG 5

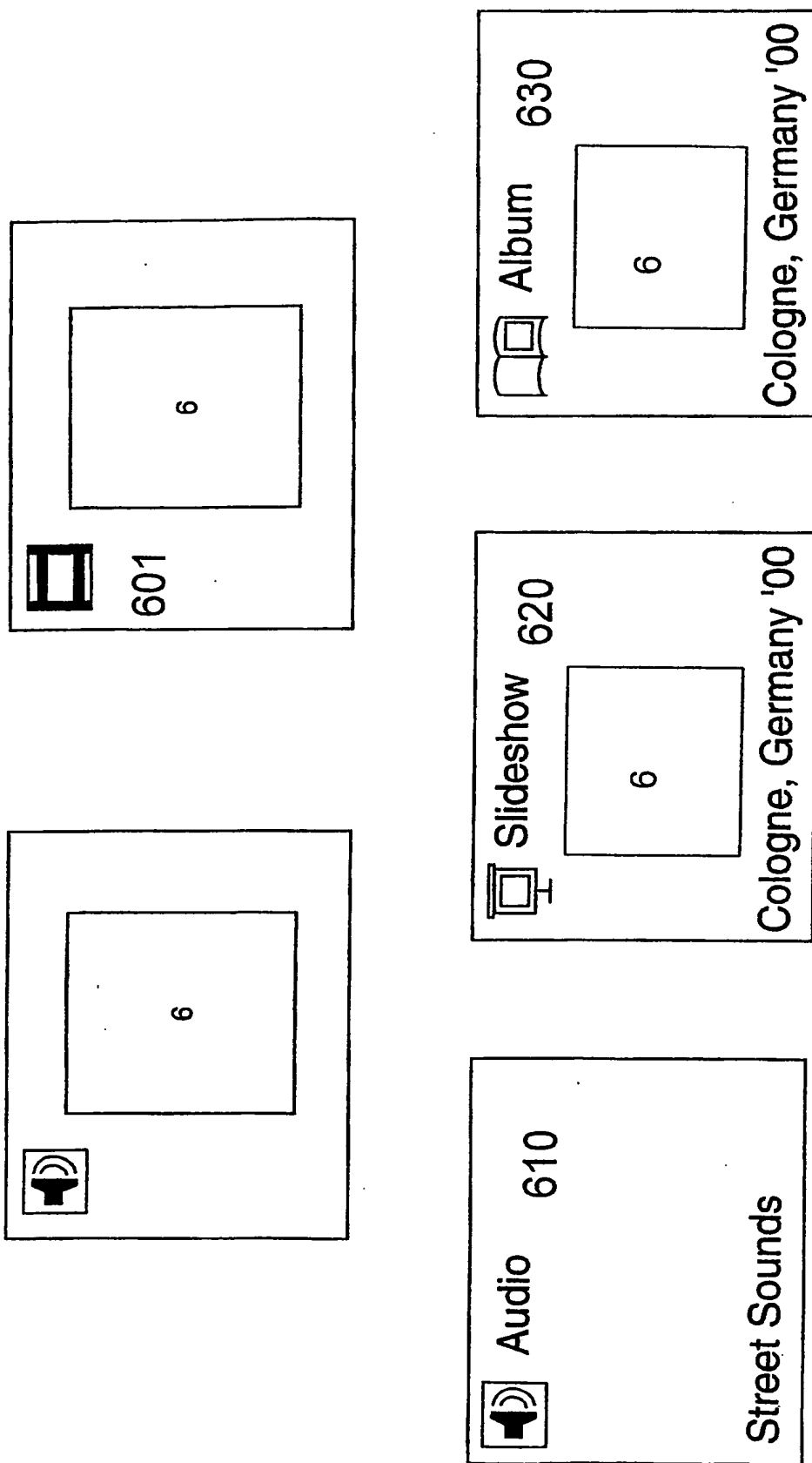


Fig. 6



**(10) International Publication Number**  
**WO 02/057959 A3**

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**(S7) Abstract:** Methods and apparatus for managing, finding and displaying objects such as digital images. Objects are tagged ("associated") with descriptive textual and numeric data ("metadata"), and stored in a relational database from which they can be selected, sorted, and found. Tags can be defined by name, tag type, and associated attributes. Objects can be tagged by dropping a tag onto the object, or relating a database record for the tag to a database record for the object. Tagged objects can be searched for and displayed according to the degree to which their metadata matches the search criteria. Visual cues can indicate whether displayed objects match all, some but not all, or none of the search criteria. Database object distributions can be displayed as histograms or scatter plots, including timelines, calendars or maps. Object distributions can be used to search for objects or to limit search results for a previous search.

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 02/01530

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 G06F17/30

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.                        |
|------------|--|--|
| X          | SHNEIDERMAN, BEN: "Designing the user interface: Strategies for effective human-computer interaction", ADDISON WESLEY, USA XP002210867<br>ISBN: 0-201-69497-2<br>* Chapter 15: Information Search and Visualization<br>page 519, line 1 -page 521, last line<br>page 526, line 3 -page 541, line 8<br>figures B2-B6<br>---<br>-/-- | 1-11,<br>24-26,<br>29-42,<br>55-57,<br>60-62 |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

26 August 2002

Date of mailing of the international search report

05.12.02

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/01530

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.                           |
|------------|--|---|
| X          | US 5 241 671 A (CARLTON RON ET AL)<br>31 August 1993 (1993-08-31)<br><br>column 2, line 30 -column 5, line 6;<br>figures 1,16-18,23<br>column 18, line 49 -column 20, line 25<br>---   | 1-11,<br>24-26,<br>29-42,<br>55-57,<br>60-62    |
| X          | US 5 734 888 A (LI SHIH-GONG ET AL)<br>31 March 1998 (1998-03-31)<br><br>the whole document<br>---   | 3,4,6,9,<br>26,30,<br>34,35,<br>37,40,<br>57,61 |
| A          | AHLBERG C: "SPOTFIRE: AN INFORMATION<br>EXPLORATION ENVIRONMENT"<br>SIGMOD RECORD, ASSOCIATION FOR COMPUTING<br>MACHINERY, NEW YORK, US,<br>vol. 25, no. 4,<br>1 December 1996 (1996-12-01), pages 25-29,<br>XP000702066<br>page 25, left-hand column, paragraph 1<br>-page 28, right-hand column, paragraph 3;<br>figure 1<br>--- | 5,7,8,<br>31,36,<br>38,39,62                    |
| A          | BEAŽA-YATES, R., RIBEIRO-NETO, B. (EDS.):<br>"Modern Information retrieval", ADDISON<br>WESLEY, USA XP002210866<br>ISBN: 0-201-39829-X<br><br>* Chapter 10: User Interfaces and<br>Visualization by Marti A. Hearst<br>page 257, line 1 -page 339, last line<br>---  | 1-11,<br>24-26,<br>29-42,<br>55-57,<br>60-62    |
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| A          | ROTH S F ET AL: "Toward an information<br>visualization workspace: combining<br>multiple means of expression"<br>HUMAN-COMPUTER INTERACTION, 1997, LAWRENCE<br>ERLBAUM ASSOCIATES, USA,<br>vol. 12, no. 1-2, pages 131-185,<br>XP002210865<br>ISSN: 0737-0024<br>the whole document<br>---   | 1-11,<br>24-26,<br>29-42,<br>55-57,<br>60-62    |

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/01530

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No.                           |
|------------|---|---|
| A          | US 5 844 572 A (SCHOTT ERIC G)<br>1 December 1998 (1998-12-01)<br><br>abstract; figure 19A  | 3,4,6,9,<br>26,30,<br>34,35,<br>37,40,<br>57,61 |
| A          | US 5 898 431 A (HOLT BAYLES ET AL)<br>27 April 1999 (1999-04-27)<br><br>abstract; figure 4  | 3,4,6,9,<br>26,30,<br>34,35,<br>37,40,<br>57,61 |
| A          | US 6 085 205 A (PEAIRS MARK ET AL)<br>4 July 2000 (2000-07-04)<br><br>column 3, last line -column 6, line 4;<br>figure 5                                  | 3,4,6,9,<br>26,30,<br>34,35,<br>37,40,<br>57,61 |
| A          | PATENT ABSTRACTS OF JAPAN<br>vol. 1996, no. 06,<br>28 June 1996 (1996-06-28)<br>& JP 08 030763 A (CANON INC),<br>2 February 1996 (1996-02-02)<br>abstract | 1,24,32,<br>55                                  |
| E          | US 6 408 301 B1 (ASHE PHILIP R ET AL)<br>18 June 2002 (2002-06-18)<br>the whole document  | 1,24,32,<br>55                                  |

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 02/01530

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
1-11, 24-26, 29-42, 55-57, 60-62

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 02/01530

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-11,24-26,29-42,55-57,60-62

The first group of claims is directed to a visual representation of a distribution of objects as a function of metadata associated with these objects and receiving user input for visually defining a query using this distribution.

2. Claims: 12-23,27,28,43-54,58,59

This group of claims is directed to the visualization of different data categories in a database based on the result of a search tag query which selects objects using their metadata search tags; in particular, there is a categorization of the objects in a best match and a no match group.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/01530

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s)  | Publication<br>date  |
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| US 6408301                                | B1 | 18-06-2002          | NONE  |  |

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